50X1-HUM

CLASSIFICATION   CONFIDENTIAL   CONFIDENTIAL

CENTRAL INTELLIGENCE AGENCY
INFORMATION FROM
FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT

CD NO.

COUNTRY	USSR
SUBJECT	Scientific - Cosmic-ray research
HOW PUBLISHED	Thrice-monthly periodical
WHERE PUBLISHED	Moscow
DATE PUBLISHED	11 Dec 1949
LANGUAGE	Russian

DATE OF INFORMATION   1948

DATE DIST. 27 Apr 1950

NO. OF PAGES   3

SUPPLEMENT TO REPORT NO.

THIS IS UNEVALUATED INFORMATION

STUDY OF THE ALTITUDE DEPENDENCE OF SHOWERS
CREATED BY PRIMARY COSMIC RAYS IN THE ATMOSPHERE

S. N. Vernov and T. N. Charakhch'yan
Moscow State U imeni M. V. Lomonosov
Phys Inst imeni P. N. Lebedev, Acad Sci USSR
Submitted 20 Aug 1948, Acad D. V. Skobel'tsyn

/Figures are appended./

To record more effectively showers created by penetrating cosmic particles in lead, a special apparatus (Figure 1) was set up to measure the penetrating component and the showers formed by it, with the help of a telescope made up of a group of counters 1 and 2.

The hard component in this telescope was measured by the registration of double coincidences between a lower small counter and three paralleled upper counters 1; and the showers were measured by the registration of triple coincidences between these same counters and four lower paralleled counters 3.

With this geometry of the telescope, the penetrating particles composing the showers in the block of lead are registered, or recorded, within the limits of a solid angle greater than the solid angle defined by the same counters of the telescope (if the shower particles diverge in a wide solid angle). Therefore, the intensity of the hard component measured by such an arrangement of the apparatus will be greater than the intensity of the hard component determined by the same geometry of the telescope.

The number of double coincidences in our telescope can be expressed thus:

$$N_{12} = N_o + kN_p' \qquad (a)$$

- 1 -

STATE	X	NAVY	X	NSRB		DISTRIBUTION								
ARMY	X	AIR	X	FBI										

where N_0 is the number of particles entering the solid angle of the telescope and not creating any showers in the lead; N_p is the number of particles entering the solid angle of the telescope and creating showers in the lead; and k is a certain coefficient, greater than unity, depending upon the geometry of the apparatus and characterizing the number of double coincidences due to showers.

With the above-described instruments, we carried out three flights in sounding balloons, which attained heights of 19, 25, and 27 kilometers. The results of measurements obtained in these flights were in close agreement.

A graph was made showing the average results of all flights (Figure 2) with indication of the magnitude of the statistical errors. Curve N_2 gives the number of double coincidences per unit time not counting the number of chance coincidences (8 percent). Curve N_3 gives the number of triple coincidences per unit time. Curve N_2-N_3 gives the difference between the double and triple coincidences. In the same graph, the calculated number of delta showers from the lead is shown for various altitudes. In the calculations, it was kept in mind that the delta showers comprised 7 percent of the hard component for all altitudes (7 percent was obtained from measurements at sea level). The difference curve N_2-N_3 gives the number of particles traversing the counters of the telescope without creating showers in the lead. The number of particles N_2-N_3 thus obtained for various altitudes is in good agreement with the results obtained in the work by K. I. Alekseyev and S. N. Vernov (see Doklady, LXIX, No 2, 1949). A sharp increase in triple coincidences with altitude indicates that the showers recorded by our apparatus originate from primary cosmic rays. By the variation in triple coincidences with altitude, we can calculate the primary cosmic particles absorbed in the atmosphere.

Another curve (Figure 3, curve 1) was found giving the increase in the number of showers as a function of the amount of matter from the outer boundary of the atmosphere in units of grams per square centimeter. In this same diagram, the exponential curve, (curve 2) exp(-mx) is drawn, where $1/m$ equals 100 grams per square centimeters. It is obvious from a comparison of these curves that below altitudes corresponding to 50 grams per square centimeters the curve describing the increase, or growth, in the number of showers agrees with the exponential curve exp(-mx) for $1/m$ equal to 100 grams per square centimeters. At altitudes lower than 20-22 kilometers, the number of showers increases more sharply with altitude. If we represent the curve describing the increase of showers in this section in the form exp(-mx), then for the quantity $1/m$ we obtain the value 50-60 grams per square centimeters. Considerations show that the indicated increase in the coefficient of absorption cannot be explained by saying that our apparatus records, at high altitudes, not only primary particles entering in the vertical direction but also primary particles entering in inclined directions.

Variations with altitude, in the law describing the absorption of particles generating the showers in great thicknesses of lead, can be connected with the presence of a considerable number of alpha particles in the composition of primary cosmic radiation.
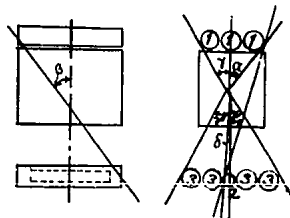
/Appended figures follow./

CONFIDENTIAL

CONFIDENTIAL

50X1-HUM

Figure 1. Arrangement of Counters
$\gamma = 30°$, $\alpha = 35°$, $\gamma' = 27.5°$, $\delta = 3°$,
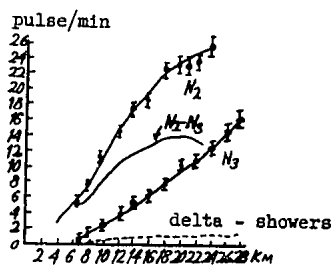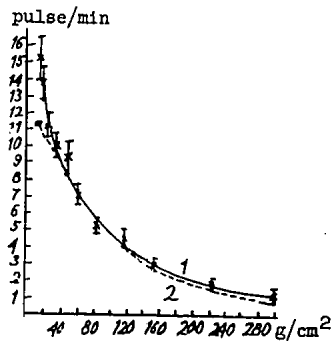$\alpha' = 15°$, $\beta = 31.5°$. 1:3

Figure 2

Figure 3

- E N D -

- 3 -

CONFIDENTIAL

CONFIDENTIAL